Breeding in an Oceanic Population of *Pleuroncodes planipes* (Crustacea, Galatheidae)[1]

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ABSTRACT: The pelagic population of *Pleuroncodes planipes* known to occur in the California Current Extension is partly recruited by drift of megalopas from neritic regions and partly, as demonstrated by EASTROPAC samples, by breeding *in situ*.

THE DISTRIBUTION of pelagic adults and larvae of the galatheid crab *Pleuroncodes planipes* in the California Current has been described recently (Boyd, 1963, 1967; Longhurst, 1967, 1968). These studies showed the regular occurrence of an oceanic population of small adults far beyond the normal neritic habitat and indicated how this expatriate population might be recruited from megalopas derived from the neritic population along the west coast of Baja California.

The Eastern Tropical Pacific (EASTROPAC) expeditions (February 1967 to March 1968 from 20° N to 20° S and from the American continent out to 126° W) afforded an opportunity to investigate this oceanic population and to test the hypothesis concerning its origin. The new data are derived from adult and larval *Pleuroncodes* sorted from the catches of 171 hauls with a 5 × 5 foot micronekton net (Blackburn et al., 1970), and 221 hauls with the standard EASTROPAC plankton net (Love, in press). Both were deployed in oblique hauls to 200 m depth.

The samples were arranged in two series: one to give coverage every 2 months of Areas 1 and 2 (Fig. 1) and the other to give coverage twice yearly (summer and winter) of Area 3. Diel migration of small individuals biased the relative numbers and size-frequency within day samples; only size frequencies of night samples are used here.

Adults of *Pleuroncodes planipes,* none of which had carapace lengths exceeding 15 mm, were found early in the year in northern Area 1. This population (carapace length 9 to 13 mm) shifted its locus in late summer until, at the end of the year, all occurrences were south of 14° N; the second winter cruise (February–March 1968) showed that the population had shifted north again to a locus between 14° to 20° N. In Area 2, adults were present only after August–September, when a population of very small (6 to 8 mm) adults appeared in the samples and remained through the end of the year.

Two populations of larvae of *Pleuroncodes planipes* were found in the samples, the first (in Area 1 in February–March 1967) being derived from *in situ* breeding. Of 2,211 adults in the samples from this cruise, 112, or approximately 10 percent of the females, were found to be ovigerous. These were all small, 1-year-old (Boyd, 1963) crabs, of carapace length 10 to 15 (mode 12) mm.

In February–March 1967, about half the plankton samples from Area 1 contained early larvae of *Pleuroncodes planipes* (stages I–II only, of Boyd, 1960), clearly derived from the local population of ovigerous females, since stage I larvae were found as far as 750 miles southwest of Cape San Lucas, Baja California. Stage I and II larvae were present in Area 1 through May and stage V larvae were found in June. In February–March 1968, early larvae were again found in central Area 1, suggesting that oceanic breeding in this region is a regular occurrence.

The second population of larvae appeared as megalopas in Area 2 in July and August, extend-

[1] This study was partly supported by Bureau of Commercial Fisheries contract no. 14-17-0001-989, and is a contribution from the Scripps Tuna Oceanography Research Program. Manuscript received September 30, 1970.

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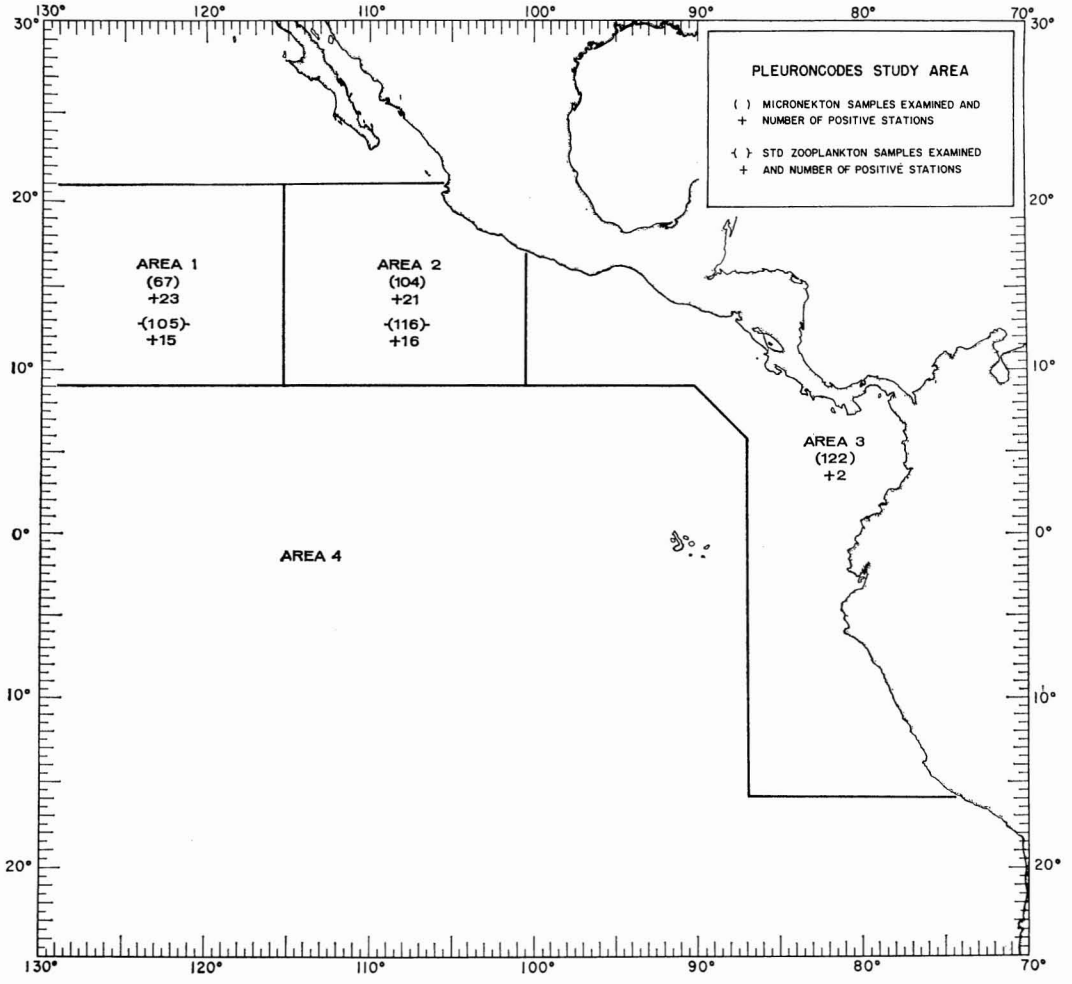

FIG. 1. The study area, and the numbers of micronekton and plankton samples sorted in Areas 1–3. An independent sorting for other purposes of about 650 micronekton samples in Area 4, north of lat. 20° S, turned up no further samples of galatheid crabs.

ing from the coast out to 112° W, and this population persisted through November, clearly giving rise to the very small (6 to 8 mm) adults mentioned above for this area in the latter part of the year. Monthly mean charts of surface current vectors (e.g., Wyrtki, 1965) suggest that this population of megalopas originated off southern Baja California or possibly in the Gulf of California.

In Area 3, 122 (micronekton net) samples were taken, and in only two of these was *Pleuroncodes* found; at one station off Central America and one off Peru, both in the southern summer, many *Pleuroncodes* megalopas were found, which were distinguishable from those of *P. planipes;* it is reasonable to assume that these belonged to *Pleuroncodes monodon,* the "langostino" of the Chile-Peru shrimp fisheries. Boyd (1963) suggested that this species might also occur off Central America, and this has recently been confirmed by specimens now in our possession from San Salvador and Costa Rica (Schaefer, personal communication) which came from a population present in commercial quantities off that coast. The megalopas and small adults (carapace 5 to 10 mm) of the two

species can be distinguished by several characters, the clearest of which are the transverse rows of setae across the carapace; these are abundant, strong, and closely set in *Pleuroncodes planipes,* but thinner and more sparsely set in *P. monodon.*

We would like to thank Maria-Luisa Rios and Nancy Neff, who sorted the samples, for their help. They were the recipients, during this study, of National Science Foundation summer studentships at Scripps Institution of Oceanography.

LITERATURE CITED

BLACKBURN, M., R. M. LAURS, R. W. OWEN, and B. ZEITZSCHEL. 1970. Seasonal and areal changes in standing stocks of phytoplankton, zooplankton, and micronekton in the eastern tropical Pacific. Marine Biology, vol. 7, no. 1, pp. 14–31.

BOYD, C. M. 1960. The larval stages of *Pleuroncodes planipes* Stimpson. Biological Bulletin, Woods Hole, vol. 118, no. 1, pp. 17–30.

——— 1963. Distribution, growth, trophic relationships and respiration of a marine decapod crustacean *Pleuroncodes planipes* Stimpson (Galatheidae). Ph.D. dissertation, University of California at San Diego. 67 pp.

——— 1967. The benthic and pelagic habitats of the red crab, *Pleuroncodes planipes.* Pacific Science, vol. 21, no. 3, pp. 394–403.

LONGHURST, A. R. 1967. The biology of mass occurrences of galatheid crustaceans and their utilization as a fisheries resource. Proceedings of the World Scientific Conference on the Biology and Culture of Shrimps and Prawns. FAO Fisheries Report 57, pp. 95–110.

——— 1968. Distribution of the larvae of *Pleuroncodes planipes* in the California Current. Limnology and Oceanography, vol. 13, no. 1, pp. 143–155.

LOVE, C. M. EASTROPAC Atlas. In press. U.S. Department of Commerce, National Marine Fisheries Service Circular.

WYRTKI, K. 1965. Surface currents of the eastern tropical Pacific Ocean. Bulletin Inter-American Tropical Tuna Commission, vol. 9, no. 5, pp. 270–304.